

7N-84-012  
177588Final Report for NASA Research Proposal:

P5

## NASA ADP PROGRAM

Proposal Title: "Expansion of the HEAO A-1" Intermediate Sensitivity Survey"

Submitted by: Chris R. Shrader, Principal Investigator

The HEAO A-1 Large Area Sky Survey experiment consisted of 7 collimated proportional counters designed to map the Sky in 0.5-25 keV X-rays. This led to the HEAO 1H All Sky Catalog (Wood et.al. 1984) complete, essentially, to a limiting flux of approximately 0.3 UFU. Supplemental work by Shrader et.al. 1986 led to enhanced sensitivity over a region of Sky centered on the ecliptic poles. This is where the deepest exposures occurred as a result of the scanning geometry. The purpose of this research was to expand by a factor of 3-4 the total solid angle of this enhanced sensitivity survey. The work was of an exploratory nature, as it was not known apriori how significant the decreased signal to noise resulting from lower exposure would impact the effort, (the exposure decreases with ecliptic latitude as approximately  $1/[a+b\cos(\beta)]$ ).

The work on this project was carried out by the PI between April 1988 and September 1990. During this period, the PI spent about one day per week as a visiting scientist at the Naval Research Laboratory (NRL). Additional work was done by accessing NRL computing facilities remotely via the "SPAN" network or telephone modem.

The following objectives of the proposal were accomplished:

- Software for reading the A-1 SCAN data base archive tapes was modified to conform to new formats (implemented by NRL).
- Available portions of the archive were read by the software. The data of relevance were extracted and written to condensed files.
- The extracted data were quality screened and a "de-glitching" noise removal technique was applied.
- The background subtraction and point summation techniques described in the proposal were applied to the available data:

(NASA-CR-193323) EXPANSION OF THE  
HEAO A-1 INTERMEDIATE SENSITIVITY  
SURVEY Final Report, Apr. 1988 -  
Sep. 1990 (Computer Sciences  
Corp.) 5 p

N94-70398

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- Partial annulus Sky-maps were constructed; refer to Figure 1.
- Point source determinations were attempted for map regions of density enhancement. 45 such source candidates were investigated over a  $70^\circ < \beta < 80^\circ$  degree annulus (table 1.).

The results of this work were unsatisfactory in that the limiting flux achieved was comparable to the 1H catalog limit. Furthermore, the source error boxes were not significantly improved. The reasons for this outcome were several fold, the most significant factor being that 30% of the SCAN data were and are still inaccessible to the PI. The portion of the data in question exist on 7 track, 800 BPI tape, and are readable only, by non-functioning and obsolete equipment at NRL. A summary of the problems encountered is as follows:

- As described above, significant portions of the data base are unavailable for use in my analysis.
- Given the limited (net) effective area of the A-1 Fine collimator modules, the geometrical factor leading to enhanced exposure is negated; significant S/N enhancement could not be achieved. The approximately 20% improvement likely from the remaining data is critical.
- The missing portion of the data was from the early stages of the mission when both fine collimator modules were functional. Subsequent portions of the data base include only one fine collimator module.

For these reasons, no refereed publication of this analysis exist. Results were discussed at various in-house seminars, and at seminars at Rutgers University and at Fordham University. Additionally, software developed for the project is being provided to the High Energy Astrophysics Science Archive Research Center (HEASARC) to support HEASARC users of the A-1 archive.

Dr. Chris R. Shrader

  
Code 668.1/CSC

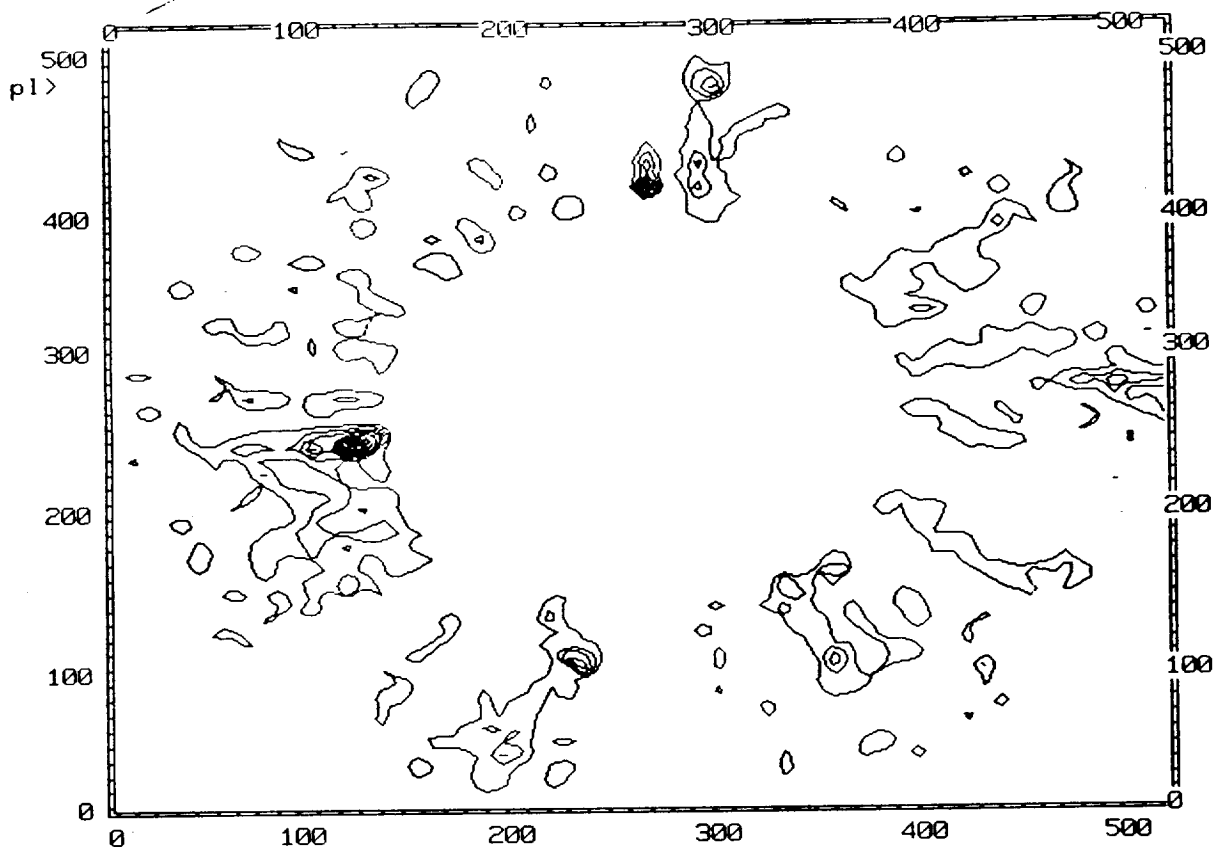
NASA/GSFC

Greenbelt, MD 20771

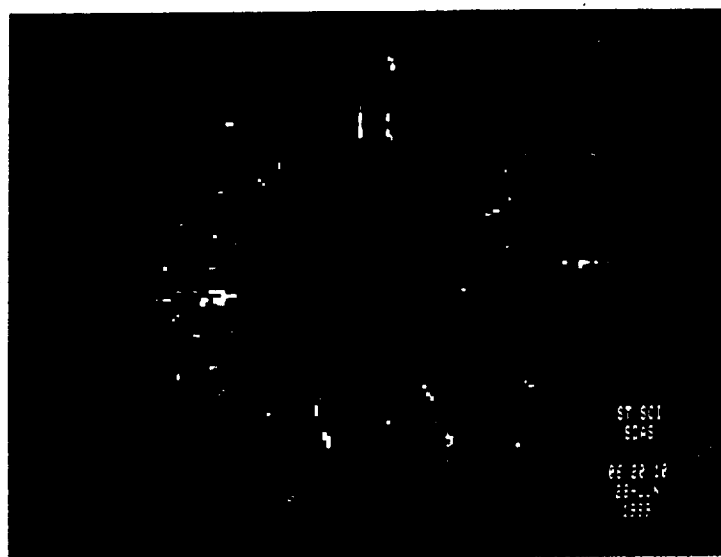
(301)-286-8434

Figure 1.

-256, 256



contoured from 0. to 136., interval = 8.  
NOAO/IRAF V2.5 SHRADER@xip Tue 10:37:32 20-Jun-89



576

	Lambda	Beta	Polar	i, j	rel-Flx	pix	X	Y	1H id	1H flx
1)	1.2	71.7	2	17	23.0	21	261	*		
2)	4.3	75.4	4	9	42.0	68	270	*		
3)	5.2	79.0	5	2	26.0	114	269	*	- 1953+654	0.209
4)	18.4	78.5	16	3	42.0	115	303	*		
5)	21.6	71.6	19	17	25.0	36	343	*		
6)	34.2	77.5	29	5	25.0	122	347	*		
7)	46.7	79.2	40	2	31.0	160	358	*		
8)	47.2	71.2	40	18	3.0	92	433	*		
9)	51.2	74.3	43	11	51.0	129	414	*		
10)	57.0	79.3	48	2	27.0	180	373	*		
11)	65.8	71.4	55	17	15.0	158	474	*		
12)	65.6	76.2	55	5	21.0	182	419	*		
13)	78.0	72.8	66	14	12.0	210	472	*		
14)	91.2	78.5	77	3	283.0	259	405	*	- 1706+786	1.080
15)	99.1	73.3	83	13	88.0	290	469	*		
16)	101.7	78.6	85	3	38.0	286	401	*		
17)	108.3	74.2	91	11	22.0	320	449	*		
18)	135.0	72.5	113	15	28.0	415	415	*		
19)	143.8	73.5	121	13	27.0	428	382	*		
20)	153.3	78.2	128	4	31.0	393	325	*	a, b	
21)	175.5	72.2	147	15	57.0	484	274	*		
22)	175.7	72.2	147	15	57.0	484	273-	duplicate		
23)	179.1	71.0	150	18	27.0	500	260	*		
24)	185.8	76.3	156	7	17.0	433	238	*		
25)	210.8	73.9	177	12	28.0	434	150	*		
26)	205.8	71.8	172	16	20.0	467	154	*		
27)	224.1	75.9	188	8	19.0	387	129	*		
28)	223.1	73.5	187	12	23.0	411	111	*		
29)	226.0	71.7	189	17	10.0	419	87	*		
30)	229.7	74.7	192	10	16.0	384	105	*		
31)	238.2	79.8	199	1	56.0	326	143	*		
32)	240.6	75.8	201	8	8.0	346	96	*		
33)	243.1	71.0	204	18	8.0	366	39	*		
34)	257.7	78.8	216	3	46.0	287	114	*		
35)	281.1	77.6	235	5	52.0	225	98	*		
36)	286.6	72.1	240	16	32.0	190	35	*		
37)	288.3	79.7	241	2	38.0	214	129	*		
38)	303.7	73.2	254	13	12.0	136	76	*		
39)	303.9	77.5	254	5	37.0	166	122	*		
40)	320.8	76.4	268	7	2.0	120	145	*		
41)	329.0	77.1	275	5	30.0	113	170	*		
42)	338.6	79.7	283	2	25.0	131	207	*		
43)	335.0	75.1	280	9	22.0	82	175	*		
44)	341.4	77.0	286	6	30.0	96	202	*		
45)	348.6	75.9	292	8	4.0	77	220	*		
46)	353.2	79.5	295	2	292.0	121	240	*		

- References -

- Shrader, C.R., Wood, K.S. and Matilsky, T.A.  
1986 Ap. J. Suppl., 61,353
- Wood, K.S., et al. 1984 Ap. J. Suppl. 56, 507.